

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,975,534 B2
APPLICATION NO. : 10/615379
DATED : December 13, 2005
INVENTOR(S) : Hideto Hidaka

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title page of the Letters Patent:

Under “(56) References Cited, U.S. PATENT DOCUMENTS”, add:

-- 5,276,650 1/1994 Kubota,
5,619,447 4/1997 Tai --

Under “(56) References Cited, OTHER PUBLICATION”, add:

-- SCHEUERLEIN, Roy E. et al., “Shared Word Line DRAM Cell”, IEEE Journal of Solid-State Circuits, Vol. 19, No. 5, October 1984, pp. 640-645,

TEHRANI, S. et al., “Recent Developments in Magnetic Tunnel Junction MRAM”, IEEE Transactions on Magnetics, Vol 36, No. 5, September 2000, pp. 2752-2757 --

Under “(56) References Cited, OTHER PUBLICATION”, change “Schauerlein” to -- Scheuerlein -- and “Durlarn” to -- Durlam --

Under “What is claimed is:”, add:

8. (New) A thin film magnetic memory device, comprising:
a memory array having a plurality of magnetic memory cells arranged in every other memory cell row and every other memory cell column such that each memory cell of said plurality of memory cells is separated from another by an adjoining memory cell location in a row direction and an adjoining memory cell location in a column direction, each of said plurality of magnetic memory cells including

a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow there through;

a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;

a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow there through in said data write operation; and

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a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow there through in said data read operation, wherein

adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines.

9. (New) A thin film magnetic memory device, comprising:
a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including
a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;

a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;

a plurality of data write lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation;
and

a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein

adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,

wherein

said adjacent magnetic memory cells share one of the corresponding write line and the corresponding write data line, which is located farther from the respective magnetic storage portions, and

said one of the write word line and the write data line has a larger cross-sectional area than that of the other of the write word line and the write data line.

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

10. (New) A thin film magnetic memory device, comprising:
a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including

a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;

a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;

a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation;
and

a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein

adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,

wherein one of each write word line and each write data line, which is located farther from the corresponding magnetic storage portions, is formed from a material having higher electromigration resistance than that of the other of each write word line and each write data line.

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

11. (New) A thin film magnetic memory device, comprising:
a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including
 a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;
 a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;
 a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;
 a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation;
and
 a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein
 adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,
 wherein
 adjacent magnetic memory cells in the column direction share a corresponding one of said plurality of write word lines,
 every two of said plurality of read data lines form a read data line pair in said data read operation,
 the magnetic memory cells selected by a same read word line are respectively connected to one of the two read data lines of each of said read data line pairs, and
 said data read current is supplied to each of the two read data lines of the read data line pair corresponding to a column selection result.

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12. (New) A thin film magnetic memory device, comprising:
a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including
 a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;
 a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;
 a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;
 a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation;
and
 a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein
 adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,
 wherein

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adjacent magnetic memory cells in the column direction share a corresponding one of said plurality of read word lines,
every two of said plurality of write data lines form a write data line pair in said data write operation,
the magnetic memory cells selected by a same write word line are respectively connected to one of the two write data lines of each of said write data line pairs, and
said second data write current is supplied to each of the two write data lines of the write data line pair corresponding to a column selection result as currents of opposite directions.

Signed and Sealed this

Twenty-sixth Day of September, 2006

A handwritten signature in black ink, appearing to read "Jon W. Dudas". The signature is stylized with a large, looped initial "J" and a distinct "D" for "Dudas".

JON W. DUDAS
Director of the United States Patent and Trademark Office